1. $\vec{\Omega}_{S/R} = w.\vec{z} = w\left(\cos\left(\frac{\pi}{2} - \alpha\right)\vec{z'} - \sin\left(\frac{\pi}{2} - \alpha\right)\vec{x'}\right)$

$= w\left(\sin\alpha\,\vec{z'} - \cos\alpha\,\vec{x'}\right)$

2) $\overrightarrow{V_{P\in S/R}} = \overrightarrow{V_{P\in S/R'}} + \overrightarrow{V_{P\in R'/R}}$

$\overrightarrow{V_a(P)} = \overrightarrow{V_{P\in S/R'}} + \underbrace{\overrightarrow{V_{O\in R'/R}}}_{=\vec{0}} + \overrightarrow{PO}\wedge\overrightarrow{\Omega_{R'/R}}$
$= \overrightarrow{V_e} + \overrightarrow{V_r}$

$\overrightarrow{V_a(P)} = \dot{r}\,\vec{z'} + r.\vec{z'} \wedge w\left(\sin\alpha\,\vec{z'} - \cos\vec{x'}\right)$
avec $\overrightarrow{OP} = r.\vec{z'}$

$\overrightarrow{V_a(P)} = \underbrace{\dot{r}\,\vec{z'}}_{V_e} + \underbrace{r.w.\cos\alpha\,\vec{y'}}_{V_r}$

4) = 3) $\overrightarrow{a(P)} = \left[\frac{d\overrightarrow{V_a(P)}}{dt}\right]_R$

$= \ddot{r}.\vec{z'} + \dot{r}\left[\frac{d\vec{z'}}{dt}\right]_R + \dot{r}.w.\cos(\alpha).\vec{y'} + r.w.\cos\alpha\left[\frac{d\vec{y'}}{dt}\right]_R$

$\left[\frac{d\vec{z'}}{dt}\right]_R = \overrightarrow{\Omega_{R/R'}} \wedge \vec{z'} = w.\cos\alpha.\vec{y'}$

$\left[\frac{d\vec{y'}}{dt}\right] = \overrightarrow{\Omega_{R/R'}} \wedge \vec{y'} = -w.\sin\vec{x'} - w.\cos\alpha.\vec{z'}$

$\vec{a}(P) = \ddot{r}.\vec{z'} + \dot{r}.w.\cos\alpha.\vec{y'} + \dot{r}.w.\cos\alpha\,\vec{y'} - r.w^2\cos\alpha.\sin\alpha.\vec{x'} - r\,w^2\cos^2\alpha\,\vec{z'}$

$\overrightarrow{a(P)} = \underbrace{\ddot{r}.\vec{z'}}_{\overrightarrow{a_r(P)}} + \underbrace{2\dot{r}\cos\alpha\,\vec{y'}}_{\overrightarrow{a_c(P)}} - \underbrace{r.w^2\cos\alpha\left(\sin\alpha.\vec{x'} + \cos\alpha\,\vec{z'}\right)}_{\overrightarrow{a_e(P)}}$

$\vec{a_e}(P=S/R) = \overrightarrow{\Omega(S/R)} \wedge \left[\overrightarrow{\Omega_{S/R}} \wedge \overrightarrow{OP}\right]$
$\vec{a_c}(S/R) = 2\overrightarrow{\Omega(S/R)} \wedge \overrightarrow{V_r(S/R)}$
$\vec{a_r}(S/R) = \left[\frac{d\vec{V_r}(S/R)}{dt}\right]_{R'}$

Torseur d'effort
calcul d'inertie